Remarks

Applicants respectfully request the Examiner to reconsider the present application in view of the foregoing amendments to the claims and the following remarks.

The Office Action is final. Upon entry of the present Amendment, claims 1-3 and 6-13 are pending. Claims 1, 12 and 13 were amended to further clarify and define the invention. Specifically, the subject matter of claim 4, now cancelled, was incorporated into claims 1, 12 and 13.

Entry of the Amendment is proper under 37 C.F.R. § 1.116, since the amendments are made in response to arguments raised in the final rejection, and place the application in condition for allowance.

Entry of the present Amendment is respectfully requested.

Claim Rejections Under 35 U.S.C. § 103(a)

The following rejections under 35 U.S.C. § 103(a) are presented by the Examiner.

Claims 1-4 and 6-13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kwon *et al.*, WO 02/083557 (hereinafter "Kwon") in view of Sonobe *et al.*, U.S. Patent No. 5,587,255 (hereinafter "Sonobe '255"), in view of Sonobe *et al.*, U.S. Patent No. 5,616,436 (hereinafter "Sonobe '436").

Claim 3 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kwon, Sonobe '255, Sonobe '436, and further in view of Nagamine *et al.*, U.S. Patent No. 5,932,373.

Claims 7, 10 and 11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kwon, Sonobe '255, Sonobe '436, and further in view of Yoon *et al.*, U.S. Patent No. 6,218,050.

Claims 8 and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kwon, Sonobe '255, Sonobe '436 and further in view of Sonobe *et al.*, U.S. Patent No.

5,527,643 and Lu *et al.*, "*Anodic Performance of Vapor-Derived Carbon Filaments in Lithium-Ion Secondary Battery*," Carbon, Vol. 39, pp. 493-496 (2001).

Claim 4 has been cancelled, thus rendering the first rejection moot as to this claim.

Applicants respectfully traverse the rejections as applied to the remaining claims.

The Examiner's Position

The Examiner asserts that the present application is obvious in light of the above cited references, as indicated on pages 2-8 of the outstanding Office Action.

Based on the following, Applicants contend that the Examiner's position is not supportable, thereby making the presently claimed invention unobvious over the cited references.

Applicants' Position

For the following discussion, Applicants have enclosed Exhibit 1 (Table A: Calculation of particle size distribution factor D_4/D_1, based on Fig. 4 of Kwon (WO 02/083557A)) and Exhibit 2 (Table B: Calculation of particle size distribution factor D_4/D_1, based on Fig. 4 of Kwon (WO 02/083557A)) for the Examiner's consideration.

Obviousness Analysis

As indicated in MPEP § 2143, the Examiner must resolve the factors described in *Graham v. John Deere*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), which provides the controlling framework for an obviousness analysis, before utilizing the rationales that were established in *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007).

Differences between the Presently Claimed Invention and the Cited References

Applicants provide the following information regarding the *Graham* factor of ascertaining the differences between the prior art and the claims that are at issue.

Kwon

The Kwon reference suggests in Figs. 1-4 (particularly Fig. 4), that Kwon's carbon particles have a broad particle size dispersion. Accordingly, based on the graph in Fig. 4 of Kwon, Applicants have calculated a particle size disperse factor, D_4/D_1, as described in paragraph [0019] of the present specification. First, an enlarged copy of Fig. 4 was obtained by utilizing an enlarging function of an electrophotographic copier. A vertical length was measured by a scale at each particle size (D) on an abscissa of the enlarged copy as it represents (*i.e.*, is proportional to) a volume (*i.e.*, weight)-basis frequency (nD^3). Calculated data for nD^3, nD, n and nD^4, based on the measured vertical lengths, are shown within Exhibit 1. Exhibit 1 also shows calculated $\Sigma\ nD^3$, Σ nD, Σ n and $\Sigma\ nD^4$, and also $D1 = \Sigma\ nD / \Sigma\ n$, $D4 = \Sigma\ nD^4 / \Sigma\ nD^3$ and D_4/D_1, calculated based thereon. Applicants note that at the bottom of Exhibit 1, it shows a calculated particle size disperse factor D_4/D_l of 7.05, which is much larger than the upper limit of 3.0 recited in amended claims 1, 12 and 13.

Incidentally, Applicants also note that Fig. 4 from the Kwon reference lacks frequency data at a particle size of 1.625 μm, which is regarded as 0 mm in Exhibit 1. To address this, Applicants included frequency data at 1.625 μm as 7 mm by interpolation between (substantially identical to) the data at 1.5 μm and 1.75 μm. Based on this data, Exhibit 2 shows a substantially identical particle size disperse factor, D_4/D_l, of 7.04.

Applicants submit that such a broad particle size distribution of the Kwon carbon particles is understandable from its production process. The Kwon process includes a step of heat-treating a mixture of a carbon precursor (such as a resin or pitch) and a dispersion media (hydrophobic inorganic substance or silicone oil) at a glass transition temperature or softening temperature of the carbon precursor to 300 °C to make the carbon precursor spherical (see Kwon, claim 8, step a).

The carbon precursor is in a solid powder form that can be mixed with a dispersion media, *i.e.*, a hydrophobic inorganic substance or silicone oil (see Kwon page 11, lines 18-20).

The hydrophobic inorganic substance or silicone oil is distributed on the surfaces of carbon precursor particles in order to restrain the cohesion of carbon precursor particles and provide a high surface tension to make the particles convert into spherical form (page 8, lines 2-24). This solid powder-form (volume-basis) distribution is considered to determine the particle size distribution of the product carbon particles since the cohesion of the particles is prevented thereafter.

The Kwon reference adopts pulverization as a means for converting the carbon precursor into solid powder form for pitch (Example 12), and for phenolic resin (Example 14; see Kwon, pages 12-15).

Applicants note that Kwon discloses that pulverized solid particles (not only of carbon) have <u>non-spherical irregular shapes</u> (see page 7, lines 16-21; page 7, lines 19-21). Applicants submit that pulverization is also well known to result in producing a powder that has a broad particle size distribution.

Therefore, the adoption by Kwon of solid pulverization provides carbon precursor particles that yields product carbon particles having an inevitably <u>broad particle size distribution</u>.

In contrast, the carbon precursor particles of the presently claimed invention are <u>spherical vinyl resin particles</u> obtained through suspension polymerization, wherein a vinyl monomer in <u>an easily dispersible and deformable liquid state</u> is subjected to a uniform stirring shearing force into fine spherical droplets having a narrow size distribution and the resultant uniformly dispersed droplets are solidified into the solid vinyl resin particles while retaining their spherical shape and uniform size distribution. This is the reason why the <u>spherical carbon electrode material of the presently claimed invention retains a very narrow particle size distribution</u> as

represented by a particle size disperse factor D_4/D_1 of at most 3.0 as recited in amended claims 1, 12 and 13, and particle size disperse factor D_4/D_1 values of 1.23 - 1.33 in Examples 1-10 of the present specification.

Obviousness Has Not Been Established

Applicants submit that based on the differences discussed above, the Examiner has not resolved the *Graham* factor of ascertaining the differences between the prior art and the claims that are at issue, and therefore the rationales the Examiner provides for the above rejections are improper.

> *"When an applicant submits evidence, whether in the specification as originally filed or in reply to a rejection, the examiner must reconsider the patentability of the claimed invention. The decision on patentability must be made based upon consideration of all the evidence, including the evidence submitted by the examiner and the evidence submitted by the applicant. A decision to make or maintain a rejection in the face of all the evidence must show that it was based on the totality of the evidence. Facts established by rebuttal evidence must be evaluated along with the facts on which the conclusion of obviousness was reached, not against the conclusion itself." In re Eli Lilly & Co., 902 F.2d 943, 14 USPQ2d 1741 (Fed. Cir. 1990). (See MPEP§ 2142; emphasis added)*

Applicants submit that the differences between the Kwon reference and the presently claimed invention are clear. Applicants note that although the above comments discuss Kwon, this was only for discussing the reference in terms of the *Graham* factor analysis. Applicants submit that taking the above *Graham* analysis in mind, the above cited references do not lead to the presently claimed invention. The secondary references, cited above, fail to cure the deficiencies of Kwon.

In light of the above amended claims and remarks, Applicants submit that the assertions made by the Examiner regarding the Kwon reference are incorrect, thus failing to support the Examiner's position. Accordingly, based on the differences between the presently claimed

invention and the Kwon reference, Kwon does not teach or suggest the presently claimed invention.

Since amended claims 1, 12 and 13 are not obvious to one of ordinary skill in the art, claims 2, 3 and 6-11, which ultimately depend from claim 1, are unobvious over the cited references for the same reasoning discussed above.

Applicants respectfully request reconsideration and withdrawal of the cited rejections.

Conclusion

Applicants respectfully submit that all of the rejections raised by the Examiner have been overcome, and that the present application now stands in condition for allowance.

Should there be any outstanding matters that need to be resolved, the Examiner is respectfully requested to contact Paul D. Pyla at the telephone number below, in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized to charge payment or credit any overpayment to Deposit Account No. 23-0975 for any additional fees required under 37 C.F.R. §§1.16 or 1.17.

Respectfully submitted,

By Paul D. Pyla #59,228
Paul D. Pyla
Registration No. 59,228
Attorney for Applicants

Attachments:

Exhibit 1: Table A: Calculation of particle size distribution factor D_4/D_1, based on Fig. 4 of Kwon (WO 02/083557A)

Exhibit 2: Table B: Calculation of particle size distribution factor D_4/D_1, based on Fig. 4 of Kwon (WO 02/083557A) for the Examiner's consideration.

PDP/acs
Washington, D.C. 20005-1503
Telephone (202) 721-8200
Facsimile (202) 721-8250
July 15, 2010

Application No.: 10/583,762 Docket No. : 2006_0963A

EXHIBIT 1

(2 pages total, including cover)

Table A: Calculation of particle size distribution factor D_4/D_1 based on Fig. 4 of Kwon (WO 02/083557A)

		Volume-basis distribution (frequency)				
No	Size: D (μm)	Relative length measured by a scale (mm))	nD^3 (%)	nD	n	nD^4
1	0.8	3	0.18121	0.283147	0.353933857	0.144971
2	0.9	4	0.24162	0.298295	0.331438747	0.217457
3	1	4.5	0.27182	0.271821	0.271821202	0.271821
4	1.125	5	0.30202	0.238636	0.212120798	0.339777
5	1.25	6.5	0.39263	0.251284	0.20102688	0.490788
6	1.375	7	0.42283	0.223647	0.162652507	0.581395
7	1.5	7	0.42283	0.187926	0.125283846	0.634249
8	1.625	0	0.00000	0	0	0
9	1.75	7	0.42283	0.138068	0.07889595	0.739958
10	1.8725	8	0.48324	0.137822	0.073602967	0.904863
11	2	8.5	0.51344	0.12836	0.064180006	1.02688
12	2.2	8	0.48324	0.099842	0.045382954	1.063123
13	2.4	9.5	0.57384	0.099626	0.041510761	1.377227
14	2.6	10.5	0.63425	0.093824	0.03608611	1.649049
15	2.8	12	0.72486	0.092456	0.033020068	2.029598
16	3	13.5	0.81546	0.090607	0.030202356	2.446391
17	3.2	15.5	0.93627	0.091433	0.028572785	2.996074
18	3.4	18	1.08728	0.094056	0.027663464	3.696768
19	3.6	20	1.20809	0.093217	0.025893652	4.349139
20	3.8	22	1.32890	0.092029	0.024218247	5.049834
21	4	24.5	1.47992	0.092495	0.023123679	5.919662
22	4.33	27	1.63093	0.086988	0.020089582	7.061915
23	4.66	29	1.75174	0.080667	0.017310558	8.163093
24	5	31.5	1.90275	0.07611	0.015221987	9.513742
25	5.5	35.5	2.14437	0.070888	0.012888759	11.79402
26	6	37	2.23497	0.062083	0.010347103	13.40985
27	6.5	39	2.35578	0.055758	0.008578184	15.31259
28	7	40	2.41619	0.04931	0.007044281	16.91332
29	7.5	41	2.47659	0.044028	0.005870443	18.57445
30	8	42	2.53700	0.039641	0.004955074	20.29598
31	8.5	42	2.53700	0.035114	0.004131077	21.56448
32	9	42	2.53700	0.031321	0.003480107	22.83298
33	9.5	44	2.65781	0.029449	0.003099936	25.24917
34	10	47.5	2.86922	0.028692	0.002869224	28.69224
35	11	58	3.50347	0.028954	0.002632211	38.53821
36	12	68.5	4.13772	0.028734	0.002394515	49.65267
37	13	79.5	4.80217	0.028415	0.002185787	62.42827
38	14	88	5.31561	0.02712	0.001937177	74.4186
39	15	94	5.67804	0.025236	0.001682383	85.17064
40	16	97	5.85926	0.022888	0.001430483	93.74811
41	17	93	5.61764	0.019438	0.001143423	95.49985
42	18	84	5.07400	0.01566	0.000870027	91.33192
43	19	70.5	4.25853	0.011796	0.000620868	80.91211
44	20	59	3.56388	0.00891	0.000445485	71.27756
45	21.66	47.5	2.86922	0.006116	0.000282351	62.14739
46	23.33	39	2.35578	0.004328	0.00018552	54.96043
47	25	31	1.87255	0.002996	0.000119843	46.81365
48	26.66	20	1.20809	0.0017	6.37559E-05	32.20779
49	28.33	10.5	0.63425	0.00079	2.78946E-05	17.96829
50	30	4.5	0.27182	0.000302	1.00675E-05	8.154636
	Total→	1655.5	100	4.022025	2.322548942	1220.537
			↑ ΣnD^3	↑ ΣnD	↑ Σn	↑ ΣnD^4

Length-average particle size $D1 = \Sigma nD/\Sigma n$ 1.73

Volume-average particle size $D4 = \Sigma nD^4/\Sigma nD^3$ 12.21

Prticle size disperse factor D4/D1 7.05

Application No.: 10/583,762 Docket No. : 2006_0963A

EXHIBIT 2

(2 pages total, including cover)

Table B: Calculation of particle size distribution factor D_4/D_1 based on Fig. 4 of Kwon (WO 02/083557A)

		Volume-basis distribution (frequency)				
No	Size: D (μm)	Relative length measured by a scale (mm))	nD^3 (%)	nD	n	nD^4
1	0.8	3	0.18045	0.281955	0.352443609	0.144361
2	0.9	4	0.24060	0.297039	0.330043215	0.216541
3	1	4.5	0.27068	0.270677	0.270676692	0.270677
4	1.125	5	0.30075	0.237631	0.211227658	0.338346
5	1.25	6.5	0.39098	0.250226	0.200180451	0.488722
6	1.375	7	0.42105	0.222706	0.161967654	0.578947
7	1.5	7	0.42105	0.187135	0.124756335	0.631579
8	1.625	7	0.42105	0.159452	0.098124236	0.684211
9	1.75	7	0.42105	0.137487	0.078563756	0.736842
10	1.8725	8	0.48120	0.137241	0.07329306	0.901053
11	2	8.5	0.51128	0.12782	0.063909774	1.022556
12	2.2	8	0.48120	0.099422	0.045191868	1.058647
13	2.4	9.5	0.57143	0.099206	0.041335979	1.371429
14	2.6	10.5	0.63158	0.093429	0.035934169	1.642105
15	2.8	12	0.72180	0.092067	0.032881036	2.021053
16	3	13.5	0.81203	0.090226	0.030075188	2.43609
17	3.2	15.5	0.93233	0.091048	0.028452479	2.983459
18	3.4	18	1.08271	0.09366	0.027546987	3.681203
19	3.6	20	1.20301	0.092825	0.025784626	4.330827
20	3.8	22	1.32331	0.091642	0.024116276	5.028571
21	4	24.5	1.47368	0.092105	0.023026316	5.894737
22	4.33	27	1.62406	0.086622	0.020004994	7.03218
23	4.66	29	1.74436	0.080328	0.017237671	8.128722
24	5	31.5	1.89474	0.075789	0.015157895	9.473684
25	5.5	35.5	2.13534	0.07059	0.01283449	11.74436
26	6	37	2.22556	0.061821	0.010303537	13.35338
27	6.5	39	2.34586	0.055523	0.008542065	15.24812
28	7	40	2.40602	0.049102	0.007014621	16.84211
29	7.5	41	2.46617	0.043843	0.005845725	18.49624
30	8	42	2.52632	0.039474	0.004934211	20.21053
31	8.5	42	2.52632	0.034966	0.004113683	21.47368
32	9	42	2.52632	0.031189	0.003465454	22.73684
33	9.5	44	2.64662	0.029325	0.003086883	25.14286
34	10	47.5	2.85714	0.028571	0.002857143	28.57143
35	11	58	3.48872	0.028832	0.002621128	38.37594
36	12	68.5	4.12030	0.028613	0.002384433	49.44361
37	13	79.5	4.78195	0.028296	0.002176584	62.16541
38	14	88	5.29323	0.027006	0.001929021	74.10526
39	15	94	5.65414	0.025129	0.001675299	84.81203
40	16	97	5.83459	0.022791	0.00142446	93.35338
41	17	93	5.59398	0.019356	0.001138609	95.09774
42	18	84	5.05263	0.015595	0.000866363	90.94737
43	19	70.5	4.24060	0.011747	0.000618254	80.57143
44	20	59	3.54887	0.008872	0.000443609	70.97744
45	21.66	47.5	2.85714	0.00609	0.000281162	61.88571
46	23.33	39	2.34586	0.00431	0.000184739	54.72902
47	25	31	1.86466	0.002983	0.000119338	46.61654
48	26.66	20	1.20301	0.001693	6.34875E-05	32.07218
49	28.33	10.5	0.63158	0.000787	2.77772E-05	17.89263
50	30	4.5	0.27068	0.000301	1.00251E-05	8.120301
	Total→	1662.5	100	4.164542	2.410894025	1216.082
			↑ ΣnD^3	↑ ΣnD	↑ Σn	↑ ΣnD^4

Length-average particle size $D1 = \Sigma nD / \Sigma n$ 1.73

Volume-average particle size $D4 = \Sigma nD^4 / \Sigma nD^3$ 12.16

Prticle size disperse factor D4/D1 7.04